TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

U.S. Army Technology Collaboration Briefing

Integrating Hybrid Powertrain Technologies for Commercial Vehicle Applications Panel Session – 2012 ATA/TMC Fall Meeting

11 Sep 2012

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
11 SEP 2012	**Briefing**	**10-08-2012 to 09-09-2012**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
U.S. Army Technology Collaboration Briefing	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
Scott Schramm	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
U.S. Army TARDEC,6501 East Eleven Mile Rd,Warren,Mi,48397-5000	**#23294**
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
U.S. Army TARDEC, 6501 East Eleven Mile Rd, Warren, Mi, 48397-5000	**TARDEC**
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)
	#23294

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES
For 2012 ATA/TMC Fall Meeting

14. ABSTRACT
briefing charts

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Public Release**	**29**	

Command Chain

Command Chain

Army Materiel Command (AMC) – Huntsville, AL

Research, Development & Engineering Command (RDECOM) – Aberdeen, MD

Tank Automotive Research, Development & Engineering Center (TARDEC) – Warren, MI

National Automotive Center (NAC) – Warren, MI

TARDEC

TARDEC: Tank Automotive Research, Development & Engineering Center

TARDEC "Branding" Mission Statement

"The DOD's Primary Source for Ground Vehicle Technology Solutions"

TARDEC Organization Competencies

Integrated Ground Vehicles	Ground Vehicle Sub-Systems and Components	Technical Capabilities and Resources
(System Competencies)	(Product Competencies)	(Engineering Competencies)

TARDEC Technology Competencies

Systems Engineer-ing	Product Support Engineer-ing	Integration	Design & Analysis	Product Assurance & Test Support	Mobility	Robotics	Electronics Architect-ure & Software	Force Projection	Power & Operational Energy	Survivability

NAC

NAC: National Automotive Center

NAC "Branding" Mission Statement

"The Connection Point for U.S. Army and Marine Corps Ground Vehicle Technology"

Mission:

"The Center will serve as the Army focal point for the development of dual-use automotive technologies and their application to military ground vehicles. It will focus on facilitating joint efforts between industry, government and academia in basic research, collaboration, technology, industrial base development and professional development."

Primary Technology Support Customers

Army Materiel Command (AMC)

Research, Development & Engineering Command (RDECOM)

TARDEC

NAC

Ground Materiel Enterprise Partners

Office of the Assistant Secretary of the Army(ASA(ALT))

TACOM LCMC

TEAM SOLDIER

ILSC

PEO CS&CSS

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Collaborations (Federal Government)

Advanced Vehicle Power Technology Alliance (AVPTA) w/ DOE

- The AVPTA is a partnership between the Department of the Army and the Department of Energy for the establishment of a joint technology research initiative in the area of ground vehicle power and energy technology research, development and transition.

- There are seven focus areas of science and technology which are: advanced combustion engines and transmissions, lightweight structures and materials, energy recovery and thermal management, alternative fuels and lubricants, electrified propulsions systems, energy storage (including batteries), and analytical tools.

- Where requirements are common, the two Departments will leverage resources to improve transition of technologies into both the commercial and military marketplace. The Alliance will also leverage industrial research and development, and partnerships involving commercial automotive and defense ground vehicle manufactures to transition technologies and increase precompetitive research and development.

Collaborations (Federal Government)

Advanced Vehicle Make

- Purpose: develop crowd sourced based process to design combat vehicles in 1/5th the time and manufacture in a geographically distributed network of factories (foundry).
  - Challenge 1: Powertrain
  - Challenge 2: Structure
  - Challenge 3: Full vehicle
- Consists of:
  - META – set of design tools that automatically evaluate designs.
  - iFAB – Instant Foundry, Adaptive through Bits is developing a set of tools capable of checking the manufacturability of a proposed design.
  - C2M2L – Component, Context and Manufacturing Model Library is a set of component model libraries containing CAD and Modelica models of all components for a given challenge.
  - VehicleForge.mil – website that will handle the security issues surrounding the challenges.
  - FANG – Fast Adaptable Next-Generation Ground vehicle program performers must integrate the above components into a comprehensive system, administer the challenges, fix the winning design to hand off to the foundry.
  - iFAB Foundry – performer must manufacture the FANG design.

Collaborations (Federal Government)

AutoHarvest

- A Memorandum of Understanding was signed by TARDEC, AutoHarvest and the Department of Homeland Security on 14 March 2012 "*to promote the adaptation of automotive-related technological innovation for use at the Federal, state, and local levels.*"
- The intent is to use the AutoHarvest open innovation website to "*efficiently communicate publicly available requirements, capability gaps, technology and information to the private sector.*"
- The Beta site compiles all automotive relevant Small Business Innovation Research (SBIR) awards for the past several years into a single searchable database.

Collaborations (Federal Government)

Technology Transfer

- Liaison to the Federal Laboratory Consortium for Technology Transfer; SAE; Automation Alley; Original Equipment Suppliers Association.
- Participate in the Department of Defense Tech Transfer Integrated Product Team.
- Manage the TARDEC Cooperative Research and Development Agreement and Education Partnership programs.
- Look for opportunities to transfer TARDEC technologies to industry and initiate TARDEC testing services for the private sector; look for outside technologies that may be of use to TARDEC; perform outreach activities and training for small businesses and others potentially seeking to do business with TARDEC.

Collaborations (State Government)

Alternative Fuel Demonstration

- TARDEC's Fuels and Lubricants Team managed the Alternative Fuel Demonstration which was executed at the Michigan National Guard's Camp Grayling.

- The Navy provided 10,000 gallons of the alternative fuel Hydroprocessed Esters and Fatty Acids Synthetic Paraffinic Kerosene (HEFA SPK/JP-) as Government Furnished Equipment for U.S. Army use in this demonstration and blended by Southwest Research Institute in San Antonio Texas with 50% regular JP-8 fuel.

- The demonstration selected tactical ground vehicles to operate during annual training periods at Camp Grayling Joint Maneuver Training Center (CGJMTC) with the HEFA SPK/JP-8 fuel blend. These evaluations were conducted on a non-interference basis to the mission of the CGJMTC.

Collaborations (State Government)

Electric Power Distribution "MicroGrid"

- TARDEC will manage the installation of a MicroGrid architecture for energy storage solutions in the direction of achieving Net Zero compliancy in accordance with the Secretary of the Army's S&T Net Zero goal. TARDEC Ground Vehicle Power & Mobility is collaborating with NextEnergy to deliver equipment to the Michigan National Guard to begin an initial integration of a MicroGrid at Camp Grayling beginning in August 2012.

- The purpose of the MicroGrid demonstration is to validate the equipment which can be used as a renewable power source to protect mission essential equipment from blackouts and brownouts. It also reduces local utility electrical usage cost in bringing this technology a set closer to Net Zero compliance.

Collaborations (State Government)

Mobile Computing Applications Platform (MCAP)

- MCAP incorporates vehicle-centric, low cost, sustainable, mobile products for the computing and communications environment. MCAP is designed to support domestic operations and uses the Department of Homeland Security (DHS) Unified Incident Command and Decision Support (UICDS) system which enables data sharing with local, state, and federal agencies.

- TARDEC's Ground Vehicle Robotics (GVR) is managing the development and evaluation of the Mobile Computing Applications Platform (MCAP). MCAP is made up of a core team in GVR, Applied Communications Sciences (Ericsson), Center for Automotive Research (CAR) in Ann Arbor, Michigan and the Michigan National Guard (MING). The MING is working with GVR to evaluate multiple scenarios for which MCAP can be utilized.

Collaborations (State Business)

Michigan Economic Development Corporation CRADA

In an effort to leverage resources from both Federal and State levels to accomplish necessary strategic objectives, TARDEC and the Michigan Economic Development Corporation (MEDC) will collaborate on the exchange of information on areas of mutual interest to the Army and many Michigan companies, particularly in the area of alternative energy, especially as it relates to vehicles and robotics.

Information regarding existing technologies, R&D, production, manufacturing, best practices, business case, and future trends will be gathered and exchanged.

The organizations seek to achieve this, in part, by mutual participation in the state's Centers of Energy Excellence (COEE) program and related programs.

Collaborations (Industry Association)

Defense Automotive Manufacturers' Consortium w/ NDIA

- The goal of the Defense Automotive Manufacturers' Consortium is to further strengthen the technology base of the U.S. defense industry through cooperative research and development.
- The Consortium will provide a forum for senior executives from both Government and Industry to periodically meet and review issues of common interest and concern.
- Topics for discussion will include policies and procedures that affect support to land systems and equipment for which TACOM LCMC and PEO Land Systems are responsible.
- DAMC Objectives include:
  - Accelerate technical development,
  - Reduce the cost for precompetitive or noncompetitive technologies and activities,
  - Identify potential areas for pooling resources to leverage capabilities across the land systems enterprise,
  - Provide a common voice to the supply base,
  - Increase the value of research investments.

Collaborations (Industry Association)

American Trucking Associations' Technology & Maintenance Council

- In Feb '11 TARDEC/NAC re-established contact with the American Trucking Associations' Technology & Maintenance Council (ATA/TMC) through attendance during the Annual Meeting.

- The objective of the Initiative is to identify areas of common interest between the commercial trucking industry and military vehicles/operations to mutually benefit the respective organizations by sharing best practices and knowledge sharing.

- NAC is providing connections to key TMC Task Forces and Study Groups including:
  - Energy Conservation
  - Specialty Trucks
    - Hybrids (Hydraulic, Conventional & Plug-in)
    - Battery Electric
  - Future Trucks

Collaborations (Industry Association)

Hybrid, Electric & Advanced Vehicle Users' Forum (HTUF)

- The U.S. Army HTUF Program is a user-driven process to commercialize medium and heavy duty hybrid, electric and advanced vehicles. The program is operated by CALSTART in partnership with TARDEC/NAC.
- The process speeds advanced dual-use truck commercialization by creating common fleet requirements, volume purchase commitment, targeted development, leveraging DOE/DOD/DOT/EPA and specifically industry investments and providing technology data to both industry and the government.
- Since 2001 this has been a TARDEC/NAC core activity that has and continues to connect the Army with industry in a collaborative manner. The key collaborative mechanism under HTUF is the user driven working groups. All major truck makers and system suppliers are involved with HTUF.

Collaborations (Industry Association)

SAE World Congress

- SAE World Congress is scheduled for 16-18 April in Detroit www.sae.org/congress/2013/
- Theme: "Achieving Efficiency"; Sponsor: Chrysler
- TARDEC has exhibited at World Congress every year, except 2010

Collaborations (Industry Association)

Automation Alley

- The purpose of this effort is to acquire collaborative technology support that advances the NAC program initiatives in the conduct of cooperative / joint ground vehicle developments and processes as part of the TARDEC mission to research, identify, assess, develop, and disseminate information to all identified small business, industry, educational institutions, and government organizations.

- The focus of this follow-on effort shall be on identifying evolving technologies and collaborative outreach acquire Commercial-Off-The-Shelf and Government-Off-The-Shelf technologies, perform analysis and provide recommendations on legitimacy of use emphasizing small businesses. As a part of this effort, the contractor shall seek firms with technologies that are relevant to the full range of military ground vehicles and TARDEC technology focus areas.

Collaborations (Corporate)

Delphi Corporation

- Delphi and TARDEC are identifying/assessing technology areas of high mutual interest which are candidates for joint development within collaborative projects that leverage respective experience, expertise and resources.

- In Dec '11 Delphi and TARDEC convened a one-day workshop that identified 19 candidate projects of mutual interest across four technology focus areas that are:
  - Energy Recovery/Thermal Management
  - Electrified Propulsion Systems
  - Energy Storage (Including Batteries)
  - Analytical Tools (Simulation & Modeling)

Collaborations (Corporate)

Troop Carrier Vehicle (8x8x8)

- TARDEC's Concepting, Analysis, Systems Simulation, and Integration (CASSI) is managing the demonstration of the Troop Carrier Vehicle (8x8x8).

- This prototype vehicle was developed and designed by ADVS in Lake Orion, Michigan as a cross between a conventional armored vehicle and a Mine Resistant Ambush Protected (MRAP) vehicle.

Collaborations (TARDEC/NAC Outreach)

Ground Vehicle Gateway (GVG)

- GVG provides a web portal where submitters can suggest R&D technologies; provide information on commercial items; request TARDEC testing services; respond to a market survey; or just make a comment or suggestion; a GVG email exists for other matters, or portal submission follow-up info.

- As of 28 August 2012, 888 GVG submissions have been received since April of 2009.

- Access to the TARDEC GVG is: https://tardec.groundvehiclegateway.com/ the GVG email address is: groundvehiclegateway@conus.army.mil

Collaborations (TARDEC/NAC Outreach)

Cooperative Research & Development Agreements (CRADAs)

- CRADAs are R&D contracts that can be signed by the Lab Director (no Procurement Contracting Officer required); lab does not give money to the contractor.
- Ancillary paperwork includes Executive Summary; Resource Report; Concurrence MOU; Close-Out report.
- Currently there are 66 active CRADA Statements of Work; four more are being routed at TARDEC for signing; several more are in various stages of preparation.

Collaborations (TARDEC/NAC Outreach)

Small Business Innovation Research (SBIR)

SBIR is a Congressionally-mandated program to increase the participation of small businesses in federal research and development (R & D).

The Small Business Technology Transfer (STTR)

The STTR program was established as a companion program to the SBIR program.

The STTR program requires participation by universities, federally funded research and development centers (FFRDCs), and other non-profit research institutions.

Each STTR proposal includes a small business (as the prime contractor for contracting purposes) and at least one research institution. The small business performs at least 40% of the work and the research institution(s) performs at least 30% of the work. The remainder of the work may be performed by either party or a third party.

Collaborations (TARDEC/NAC Outreach)

Automotive Research Communications Initiative

Support of the NAC at TARDEC with the visualization, conceptualization, planning and execution of advanced technology initiatives to further advance the NAC/TARDEC missions. Initiatives will originate from a range from automotive-related areas including (but not limited to):

- Automotive manufacturing technologies such as robotics, control systems, scheduling logistics, metrology, material handling, etc.
- Alternative powertrains (spark ignited, compression ignited, hybrid electric, electric, and fuel cells).
- Powertrain technologies such as transmissions, engine boosting (turbo chargers and super chargers), homogeneous charged compression, direct injection, etc.
- Advanced light-weight materials including high strength steel, aluminum, magnesium, carbon fiber composites, etc. Also the issues involving the design integration, joining, corrosion mitigation, recycling, and supply chain development.
- Alternative fuels including biofuels, hydrogen, electricity, diesel, etc.
- Vehicle electronics, both on the vehicle and the infrastructure to support smart, connected vehicles with the potential of autonomous driving.

Collaborations (Educational Outreach)

Educational Outreach Program

- Since FY89, TARDEC has conducted educational outreach to K-12 schools throughout the United States. The program consists of presenting science/math lectures and experiments to K-12 teachers and students with particular emphasis on middle school students.
- The NAC was appointed "Scientific Advisor" to Detroit Public Schools (DPS) due to national dominance ($70,000 in awards) in E-Cybermission of Detroit students. TARDEC from 2002-2005 won more E-Cybermission awards than any other DoD command.
- TARDEC's educational outreach has involved the following public school systems; Philadelphia, Denver, Phoenix, Los Angeles, Chicago, New York, Jacksonville, Miami, Baltimore, Washington, D.C., Ann Arbor, Detroit, Romulus, etc…
- Influenced re-opening of Durfee Middle School (DPS) from closure list.

Collaborations (Educational Outreach)

University Partnership Examples

- **Wilberforce University (WU)** - Dislocation Behavior in Ti-Al Alloys for Armor Applications
- **University of Illinois – Chicag o(UIC)** - Flexible Multi-body System Dynamics Research
- **University of California – Los Angeles (UCLA)** - Development of High-Strength Nanostructured Magnesium Alloys
- **Northwestern University (NU)** - Quantification of Model Uncertainty with Enhanced Identifiability
- **Clemson University (CU)** - Fault Tolerant Hydraulic Hybrid System
- **City College of New York (CCNY)** - Advanced Lightweight Composite Armors
- **University of Wisconsin (UW)** - Development of Scalable Numerical Methods for Accurate Modeling & Simulation of Multibody Dynamics Systems
- **Oakland University (OU)** - Reliability Assessment and Optimization of a Smart Charging Microgrid

Upcoming Events Schedule

Events

- 18 → 20 Sep, Hybrid Truck Users Forum (HTUF) National Conference and Exposition, Charlotte Convention Center, Charlotte, NC.
- 2 → 3 Oct, SAE Commercial Vehicle Engineering Congress (ComVec), Donald E. Stephens Convention Center, Rosemont, IL.
- 2 → 4 Oct (Tentative), Pentagon Energy Security Event, Pentagon, VA.
- 22 → 24 Oct, Association of the U.S. Army (AUSA) Annual Meeting and Exposition, Walter E. Washington Convention Center, Washington, DC.

Points of Follow-up Contact

National Automotive Center (NAC)

- Mr. David Thomas, Director National Automotive Center
  - Office Phone: 586.282.6387
  - Mobile Phone: 586.530.7805
  - E/M: david.j.thomas1.civ@mail.mil
- Mr. Scott Schramm, Government & Industry Collaboration Manager
  - Office Phone: 586.282.4122
  - Mobile Phone: 586.306.4365
  - E/M: scott.w.schramm.civ@mail.mil
- Ms. Stacy Mills, Special Projects Officer
  - E/M: stacy.l.mills6.civ@mail.mil
- Mr. Pete Disante, Ground Vehicle Gateway Manager
  - E/M: peter.g.disante.civ@mail.mil

Summary

The Subject Briefing Presented:

- Overview of the TARDEC/NAC Command Chain
- TARDEC/NAC's Primary Technology Support Customers
- Collaboration Examples
- Upcoming Events Schedule
- Points of Contact